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Factors Influencing Producer Support for a State Mandatory Seed Law: An Empirical Analysis

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A probit model identifies characteristics influencing Idaho potato producer support or opposition to a state mandatory certified seed law. Economic self-interest appears to be the most important influencer. Current users of certified seed and growers of certified seed are strong supporters. However, producer attitudes about the impact of seed-borne diseases and effectiveness of certified seed as a control mechanism also are important. Respondent characteristics (gross farm income, potato acreage, and geographic region of the state) seem to be less important influencers.

Key words: grower survey, mandatory seed law, probit model, seed potatoes.

Introduction

The decision-making process for agricultural producers is influenced by several factors related to the physical, economic, and political environment in which they operate. Policy decisions, at both the state and federal levels, are becoming an increasingly important factor impacting agricultural producer decisions. Provisions of the Farm Bill, marketing orders, and tax laws represent the more commonly analyzed policy areas having a significant impact on decisions of agricultural producers. An extensive number of studies analyzing policy impacts on producer behavior have used some type of profit maximizing economic model to determine the anticipated producer response. Examples of Farm Bill provisions include crop acreage response models by Chavas and Holt, and farmer responses to conservation provisions of the 1981 and 1985 Farm Bills (Helms, Bailey, and Glover). The expected response of profit maximizing producers to a marketing order was modeled by Berck and Perloff using a dynamic approach. Economic models addressing producer response to changes in tax policy include studies by Hanson and Bertelsen, and Lins, Offutt, and Richardson.

A limited number of studies have explicitly examined producer preferences for policy alternatives. With regard to the Farm Bill, Edelman and Lasley analyzed policy preferences from a sample of Iowa farm operations. Orazem, Otto, and Edelman used an ordered probit model to assess farmers' opinion formation regarding alternative farm policy provisions. Two studies (Hallagan; Mixon, Turner, and Centner) explicitly examined producer voting behavior regarding marketing orders. The Hallagan study looked at voting behavior for a federal hop marketing order in Washington. Mixon, Turner, and Centner analyzed factors influencing both the producer's decision to vote and voting behavior on a Georgia state marketing order for Vidalia onions. Hanson, Kinnucan, and Otto explicitly examined

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producer attitudes regarding alternative tax policies. Efforts to analyze factors that explain actual legislator voting behavior regarding agricultural and resource legislation also are limited (Abrams; Lee and Tkachyk).

Extensive research has focused on impacts of various policy decisions. Typically, this research concentrates on national agricultural programs and applies an economic modeling approach to measure the anticipated response. This anticipated response is then used as a basis for assessing impacts of the policy decision. Analyses exploring producer attitudes about policy alternatives (or factors which may influence their attitudes) have been undertaken, but are much fewer in number. Additionally, very few studies have explicitly investigated state policies affecting the behavior of agricultural producers.

Several factors concerning state-level policy decisions suggest additional research is warranted. Many policies initiated at the state level have implications beyond state boundaries. For example, the initiation of a state mandatory seed potato law in Maine provided a strong motivation for other states (Idaho and Wisconsin) to explore similar laws. Potential reduction or elimination of federal support programs likely will intensify competition between states in several commodity areas, especially for specialty or nontraditional crops and livestock. Additional state-level legislation attempting to improve a state's competitive market position (through control orders mandating specified production practices, organic certification programs, marketing orders, promoting the state's agricultural products in the international market, etc.) is a likely response.

Two influential commodity groups from the Idaho potato industry (the Idaho Potato Commission and Potato Growers of Idaho) have expressed interest in a state mandatory seed law. This interest developed after a national potato industry task force proposed state mandatory seed laws as one recommendation for eradication of bacterial ring rot. Bacterial ring rot is one of the more devastating potato diseases. One infected plant or tuber in a seed lot causes the entire lot to be rejected for certification. In commercial potatoes, bacterial ring rot usually causes large yield and storage losses. Maine, Minnesota, Montana, and New Brunswick, Canada currently have mandatory seed laws and several other states are considering such legislation (Guenthner et al.). A survey of potato growers in Idaho recently was conducted to determine their support for legislation requiring the use of certified seed for all potato acreage planted in the state. This article uses survey data to analyze economic variables and other respondent characteristics which are hypothesized to influence producer support for the mandatory seed law.

Data

A combination mail and telephone survey of Idaho potato producers was conducted during the early summer and fall of 1989. The initial mail survey was sent to 1,937 names included on the mailing list for Potato Growers of Idaho. Since the mailing list was known to include individuals and organizations not growing potatoes, the questionnaire included a postcard to be returned by ineligible respondents (nonpotato producers). The total survey design method was used for the mail survey (Dillman). A telephone survey of nonrespondents was conducted using an identical survey questionnaire. From the list of 1,937 names, 882 were identified as ineligible, leaving an eligible sample of 1,055. A total of 716 producers completed the mail survey and 166 completed the telephone survey. No significant between-group difference was identified in the responses of mail versus telephone respondents. The total sample of 882 represents an 83.6% response rate. Elimination of respondents not providing all of the necessary information used for the analytical model resulted in 588 usable responses.

The survey instrument solicited information about whether or not the respondent strongly favored, somewhat favored, somewhat opposed, or strongly opposed an Idaho mandatory seed law. Those in the first two categories were viewed as favoring the law and the second two categories were viewed as opposed.[1] Additional data regarding personal and farm

characteristics, attitudes regarding seed-borne disease problems, the effectiveness of other potential solutions to seed-borne diseases, and farm location were also obtained.

Implementation of a mandatory seed law would be accomplished through the legislative process. The Idaho Potato Commission and Potato Growers of Idaho are recognized within the state as the two primary representative groups for the potato industry. Information from the two groups prior to the survey and the cover letter included with the survey questionnaire provided a clear message to producers that their responses on the survey would be construed as a vote for or against such legislation. Even though an indication of support or lack of support on the survey is not an explicit vote, respondents likely viewed their responses as their primary opportunity to "vote" on the mandatory seed law.[2]

Empirical Model

The primary focus of this analysis is to identify respondent characteristics which influence whether they favor or oppose an Idaho mandatory seed law. Binary choice models have been widely used to assess factors influencing an individual's choice from among two or more alternatives. Such models are strongly linked to utility theory (Amemiya), and their application is well described in most econometrics texts (Judge et al.). Due to problems with the linear probability model, the probit and logit specifications are commonly used. Selecting between the probit and logit specifications is not strongly supported on theoretical grounds and results have been similar in direct comparisons of the two specifications (Capps and Kramer). The probit specification is used for this analysis.

The decision to support or not support a state mandatory seed law is hypothesized to be influenced by four groups of variables. The first variable group highlights producer concern about seed-borne diseases and how producers feel about use of certified seed as an effective procedure in reducing such disease problems. These variables represent an attempt to capture the producer's general attitude about the seriousness of seed-borne diseases.

The second set of variables considers geographic location. Different regions of Idaho produce potatoes for a different mix of market outlets: the processed market (southwest), the fresh market (southeast), or both fresh and processed (south central). Processors are sensitive to the impacts of seed-borne disease problems and generally procure potatoes through preplanting contracts. These contracts typically require growers to use certified seed. Thus, the level of processor involvement will likely influence to what degree growers already have a "mandatory" certified seed requirement.

Third, economic self-interest generally is expected to influence producer voting behavior (Mixon, Turner, and Centner; Orazem, Otto, and Edelman). The economic self-interest impact is measured by classifying respondents as commercial producers (produce potatoes for the food market) or seed potato producers. Seed potato producers are likely to benefit from a mandatory seed law (most noncertified seed potatoes are own-grown seed) due to a higher demand for their output. Commercial growers likely will have higher seed costs, and may see a mandatory seed law as increasing costs and reducing flexibility in their farming operations.

Finally, personal and business characteristics of the respondents are included. Acres of commercial potatoes, gross farm income (a proxy for farm size), and the producer's current use of noncertified seed were the three variables selected to reflect general characteristics of the respondents. Educational level and age were included in an alternative specification of the model. Both variables were insignificant and eliminated from the final model specification.

The estimated probit model is specified as:

$$SEEDLAW = f(PROB1, PROB2, PROB3, REGION_i, SEEDGRWR, COMACRES, INCOME_i, NONCERT).$$

Table 1. Definitions and Predicted Coefficient Signs of Variables Used to Analyze Factors Influencing Producer Support for a State Mandatory Certified Seed Law in Idaho

Variable Name	Variable Definition	Predicted Sign
SEEDLAW	1 if favored a state mandatory seed law, 0 if opposed to the law.	
*PROB*1	Concern about seed-borne diseases in seed potatoes as a problem within the Idaho potato industry (1 if perceive the problem as serious, 0 otherwise).	+
*PROB*2	Concern about the quality of certified seed and the certification procedure (1 if perceive the problem as serious, 0 otherwise).	−
*PROB*3	Concern about poor quality seed adversely affecting the reputation of Idaho commercial potatoes (1 if perceive the problem as serious, 0 otherwise).	+
$REGION_i$	Region of the state where potato operation is located (i = 1 for the southwest region, 2 for the south central, and 3 for the southeast).	+ (i = 1) + (i = 2)
SEEDGRWR	Type of potato grower (1 if over 50% of potato acreage is for seed purposes, 0 otherwise).	+
COMACRES	Total acres of potatoes grown for commercial purposes.	−
$INCOME_i$	Gross farm income (i = 1 for less than $100,000, 2 for over $500,000, and 3 for $100,000 to $500,000).	− (i = 1) − (i = 2)
NONCERT	Current use of noncertified seed (1 if currently using any noncertified seed for planting potato acreage, 0 otherwise).	−

Definitions for the model variables and predicted signs for the associated parameters are presented in table 1.

Table 2 provides a summary of the responses for the model variables. Model parameters were estimated using a maximum likelihood procedure employing the Newton–Raphson convergence algorithm. For the two variables with three categories (those subscripted with an i), the final category (i = 3) was excluded in the estimation procedure to eliminate the singular matrix problem.

Results

Estimated model parameters and related statistical information are presented in table 3. Results indicate a high level of significance for several variables and the model produces expected signs for the explanatory variables. Predictive capability is quite good, with a percentage of correct predictions equal to 74.7% and an R^2 (Maddala) of .248. The model tends to predict supporters of the mandatory seed law (sensitivity) more accurately than those opposed (specificity).

The three attitudinal variables (*PROB*1, *PROB*2, and *PROB*3) have the expected sign, are consistently significant, and tend to cause a relatively large change in the probability of supporting a mandatory seed law. The coefficient for *PROB*1 is positive, indicating that concern about the impact of seed-borne diseases within the Idaho potato industry increases the probability of supporting the mandatory seed law. The coefficient for *PROB*1 is significant (α = .01). The negative coefficient for *PROB*2 indicates that as the level of concern about the quality of certified seed increases, support for a mandatory seed law decreases. The sign of *PROB*2 is as expected and the parameter is significant (α = .05). However, the impact of *PROB*2 on the probability of supporting a mandatory seed law is the smallest of the three attitudinal variables. *PROB*3 has a positive coefficient, suggesting that concern about seed-borne disease problems adversely impacting the reputation of Idaho's commercial potatoes tends to increase support. The parameter for *PROB*3 is significant (α = .01) and the variable has a major impact (.290) on the probability of supporting a mandatory seed law.

Table 2. Response Patterns for Variables Included in the Analytical Model Used to Assess Factors Influencing Producer Support for a State Mandatory Certified Seed Law in Idaho

Variable	Response Categories (number of respondents)		
SEEDLAW	Support	Not Support	
(n)	(378)	(210)	
*PROB*1	Serious Problem	Not a Serious Problem	
(n)	(163)	(425)	
*PROB*2	Serious Problem	Not a Serious Problem	
(n)	(224)	(364)	
*PROB*3	Serious Problem	Not a Serious Problem	
(n)	(206)	(382)	
REGION	Region 1 (SW)	Region 2 (SE)	Region 3 (SC)
(n)	(48)	(342)	(198)
SEEDGRWR	Seed Grower	Commercial Grower	
(n)	(79)	(509)	
COMACRES[a]	Low	Average	High
(acres)	(0)	(292)	(8,100)
	Less than	$100,000 to	Over
INCOME	$100,000	$500,000	$500,000
(n)	(59)	(266)	(263)
	Don't Use 100%		
NONCERT	Certified Seed	Use 100% Certified Seed	
(n)	(197)	(381)	

[a] All variables except *COMACRES* are categorical in nature and the number of responses in each category is presented. For *COMACRES*, the range and average size in acres are presented.

The location variable representing the southwestern region of Idaho (*REGION*1) is significant ($\alpha = .01$) and the sign is positive as expected. The southwest part of the state is dominated by contract growers who generally are required by processors to use certified seed. The impact on the probability of supporting the law (.067), however, is relatively small. *REGION*2 represents the south central part of the state, which has both open market and contract growers. The positive coefficient indicates growers in this region are more likely to support the law compared to the base region (*REGION*3, or southeast). *REGION*2 tends to have a relatively large impact on the probability of supporting the mandatory seed law, but the parameter is not significant. Location consistently has the expected impact on support for the mandatory seed law, but the degree of the impact is relatively small for *REGION*1 and the parameter for *REGION*2 is not significant.

The economic self-interest component is related to type of grower. Results indicate seed potato producers tend to support the mandatory seed law. Major seed growers produce primarily certified seed and logically can expect to benefit from a mandatory seed law. The *SEEDGRWR* variable has a positive coefficient, is significant ($\alpha = .01$), and has the largest impact on the probability of favoring the seed law (.318).

The three measures of producer characteristics (*COMACRES, INCOME,* and *NONCERT*) have the expected sign. *COMACRES* represents the number of acres of commercial potatoes, and the coefficient is negative. Larger commercial producers are more likely to use their own seed. Being required to purchase certified seed or certify their own seed will represent an increase in costs. Thus, the larger commercial growers tend not to support a mandatory certified seed law. With regard to farm income, the middle income level (*INCOME*3, or gross farm income from $100,000 to $500,000) represents the base. The lowest income level (*INCOME*1) has a negative coefficient and is significant ($\alpha = .05$). The higher income category (*INCOME*2) also has a negative coefficient but is not significant. The impact on the probability of favoring a mandatory seed law is relatively large (−.201) for *INCOME*1, but comparatively minor for *INCOME*2 (−.056). This

Table 3. Maximum Likelihood Estimates from the Probit Model Used to Analyze Factors Influencing Producer Support for a State Mandatory Seed Law in Idaho

Variable Name	Estimated Parameter	t-Ratio[a]	Change in Probability[b]
Constant	.261	1.93*	—
*PROB*1	.457	3.09***	.165
*PROB*2	−.309	−2.29**	−.122
*PROB*3	.927	6.49***	.290
*REGION*1	.879	3.14***	.067
*REGION*2	.175	1.36	.280
SEEDGRWR	1.071	4.45***	.318
COMACRES	−.001	−1.34	−.037
*INCOME*1	−.511	−2.48**	−.201
*INCOME*2	−.142	−1.05	−.056
NONCERT	−.588	−4.59***	−.230
Number of Observations (n) = 588			
% of Correct Predictions = 74.7%			
Sensitivity[c] = 83.1%			
Specificity[c] = 59.5%			
Maddala R^2 = .248			

[a] Tests if the parameter estimate is significantly different from zero (significance at the 10% level is indicated by *, the 5% level by **, and the 1% level by ***).

[b] The change in probability is calculated at the dominant observed value for all categorical variables, and mean value for the continuous variable (see table 1). All variables except *COMACRES* are 0–1 in nature, implying the change in X_i is a one-unit change. For *COMACRES,* the change is a 1% change in acres.

[c] Sensitivity measures the percentage of actual 1 values (favor) that were predicted correctly; specificity measures the percentage of 0 values (don't favor) that were predicted correctly.

inconsistency in results for income may reflect the small number of responses in the *INCOME*1 category.

The last variable in the producer characteristics group (*NONCERT*) has a negative sign as expected. Producers who currently use some noncertified seed tend not to support the mandatory seed law. Additionally, the parameter is highly significant ($\alpha = .01$) and has a substantial negative impact on the probability (−.230) of supporting the law (table 3).

Summary and Implications

Only a few studies have directly analyzed factors influencing producer "voting" behavior regarding important policy decisions, especially for programs at the state level. This study analyzes factors influencing producers' decisions to favor or oppose a state mandatory certified seed law in Idaho. Survey data are used to estimate a binary choice model using a probit specification.

The one specific economic self-interest characteristic (being a certified seed grower) plays the most significant role in the "voting" behavior of Idaho potato producers. However, factors other than conventional grower characteristics also appear to be important. Three variables reflect individual attitudes about the use of certified seed. The level of concern about the impact of poor quality seed on the reputation of Idaho potatoes (*PROB*3), concerns about seed-borne disease (*PROB*1), and concerns about the certification procedure (*PROB*2) all are significant and have a major impact on the probability of supporting the mandatory seed law. Location (which is hypothesized to reflect the impact of contractual requirements) is significant for the southwestern region. Producers currently

using noncertified seed tend not to support the law. This variable (*NONCERT*) is highly significant and is associated with a large negative change in the probability of supporting the law. Acres of commercial potatoes and income have the anticipated impact, but the significance levels and changes in the probability of supporting the law are somewhat inconsistent.

From a broader perspective, this analysis tends to support other evaluations of "voting" behavior by producers that suggest policy preference is determined largely by economic self-interest (Hallagan; Mixon, Turner, and Centner; Orazem, Otto, and Edelman). Conceptually, such results lend support to economic models which predict voting behavior, response to policy changes, and eventual welfare impacts based on profit maximizing behavior of producers. However, results also suggest factors external to the producer can have significant impacts. In this analysis, concern about longer run impacts of poor quality seed on the Idaho potato industry and concern about the certification process are major factors influencing support for a mandatory seed law. Even though these factors eventually can impact individual producer profitability, they do not represent the type of variables traditionally used in economic analyses of producer behavior. The attitudinal component of voting behavior (producer attitudes about seed-borne diseases and using certified seed as a control measure) appears to be important and should be addressed. Additionally, the region impact (which was hypothesized to reflect the requirements of contractors) suggests marketing procedures may play an important role in producer voting behavior.

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Notes

[1] There were four possible responses to the question about an Idaho mandatory seed law: strongly favored, somewhat favored, somewhat opposed, or strongly opposed. Since these responses can be ordered, an ordered probit model was estimated using the LIMDEP software (Greene). The ordered model predicted 290 of 588 observations correctly (49.3% correct predictions). Additionally, the ordered probit model predicted no outcomes for the category "somewhat opposed" compared to 91 actual observations in that category. Results of the ordered model suggest responses to the mandatory seed law are solicited in a subjective rather than an objective manner. No common yardstick is available to ascertain that the ordering of the intensity of support (or lack of support) is consistent interpersonally. Consequently, these four responses are aggregated into two categories: favor versus oppose.

[2] Strategic voting behavior may be a factor in observed voting patterns. However, the high response rate for this type of survey (83.6%) implies a strategy of not voting to accomplish some objective is not a significant issue. Additionally, there is no obvious economic incentive for any group of producers to vote contrary to their preferences.

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